

CLAIMS

What is claimed is:

1. A robust adaptive filter comprising:
 a fast impulse response filter;
 a coefficient vector update device connected to said fast impulse response filter for feeding adaptive coefficients thereto in response to a received error signal; and
 a modifying device for modifying said adaptive coefficients by application of an adaptive scaled non-linearity.

2. A robust adaptive filter comprising:
 an adaptive filter utilizing a fast converging adaptive algorithm; and
 means for modifying said algorithm by the application thereto of an adaptive scaled non-linearity.

3. The filter of claim 2, wherein the fast converging algorithm is PNLMS.

4. The filter of claim 2, wherein the fast converging algorithm is PNLMS++.

5. The filter of claim 2, wherein the fast converging algorithm is APA.

6. The filter of claim 2, wherein the fast converging algorithm is PAPA.

7. The filter of claim 3, wherein the adaptive scaled non-linearity is given by

$$\Psi\left(\frac{|e_n|}{s}\right) \text{sign}\{e_n\} s_n.$$

8. The filter of claim 4, wherein the adaptive scaled non-linearity is given by

$$\Psi\left(\frac{|e_n|}{s}\right) \text{sign}\{e_n\} s_n.$$

9. The filter of claim 5, wherein the adaptive scaled non-linearity is given by

$$\Psi\left(\frac{|e_n|}{s}\right) \text{sign}\{e_n\} s_n.$$

10. The filter of claim 6, wherein the adaptive scaled non-linearity is given by

$$\Psi\left(\frac{|e_n|}{s}\right) \text{sign}\{e_n\} s_n.$$

11. A robust echo canceller for use in a telephone circuit, comprising:
- an adaptive filter connected to said telephone circuit for outputting an error signal corresponding to a detected echo signal;
 - a vector coefficient update device connected to said filter for feeding adaptive filter coefficients thereto in response to a modified error signal; and
 - a device for modifying said adaptive coefficients by modifying said error signal through the application of an adaptive scaled non-linearity to said error signal to generate said modified error signal.
12. The echo canceller of claim 11, further comprising a double talk detector connected to said telephone circuit for disabling said update device in response to the detection of double talk on said circuit.

13. A robust echo canceller comprising:

an adaptive filter for outputting an error signal in response to a detected echo signal; and

means for supplying adaptive filter coefficients to said filter, wherein said filter coefficients are given by
$$h_{n+1} = h_n + \frac{\mu}{x_n^T G_n x_n + \delta} G_n x_n \phi(|e_n| \text{sign}\{e_n\}),$$

14. The echo canceller of claim 13, further comprising a double talk detector connected to said telephone circuit for disabling said update device in response to the detection of double talk on said circuit.

15. A robust echo canceller comprising:

an adaptive filter for outputting an error signal in response to a detected echo signal; and

means for supplying adaptive filter coefficients to said filter, wherein said filter coefficients are given by $h_{n+1} = h_n + \mu G_n X_n R_{xx}^{-1}(n) [\varphi(|e_n|) \odot \text{sign}(e_n)]$.

16. The echo canceller of claim 15, further comprising a double talk detector connected to said telephone circuit for disabling said update device in response to the detection of double talk on said circuit.